Introduction to the WRF EMS

For this exercise, you will configure and run a short model simulation for the purpose of familiarizing yourself with the WRF EMS package. Step-by-step directions will guide you through the process of setting up and running the model, and there will be a few questions along the way that will require you to investigate various parts of the system. The critical learning objective in this exercise is the process of running the model and not the interrogation of the forecast; however, you will have an opportunity to examine and share results with others if time allows.

Step I Create a computational domain

In the previous exercise you installed the WRF EMS on your workstation and ran the benchmark case. You will now use your wrf installation to create the computational domain for your simulation.

Do: % cd $WRF_RUN

You should see nothing. That is because you need to create your domain using the static initialization GUI (SIGUI). The specifications for the ARW and NMM domains are provided in appendix A. If you are running the ARW (NMM) core then use the ARW (NMM) domain configuration. A screen capture of the SIGUI horizontal domain configuration window is also provided in appendix B.

For both simulations, the areal coverage and grid spacing of the model domains are the same. The only difference in the computational domains is the horizontal grid point dimensions specified for the ARW and NMM cores.

Do: % sigui

The static initialization GUI should appear like magic. The name that you provide for your domain in the SIGUI can be whatever you like provided that you can remember it. Simply follow the specifications in appendix A for your configuration.

Do: Decide whether you want to run the ARW or NMM core. Just pick one or the other.

When your domain is configured, go ahead and run the localization, which should take a few minutes. When the localization has completed, exit out of the SIGUI by answering with a “yes” and “yes”.

Do: % cd $WRF_RUN/<your domain>

Step II Process the initialization files

In each of the <domain> directories you will find four WRF EMS Perl scripts, **wrf_autorun, wrf_prep, wrf_run, and wrf_post**. These four files are known as the "run-time" scripts and are actually links to files in the $WRF_STRC directory. These are the only routines you need to run the model successfully. If you are a glutton for punishment you may review the documentation with each of these scripts by running “<script> --help” and “<script> --guide”; however, there is no need to do this step for the lab. All you need to do is follow the directions below.

The first step in running the WRF EMS, besides following the instructions, is to run the wrf_prep routine with the data set used to initialize your model simulation. The

primary purpose of the wrf_prep script is to identify, acquire, and process the external data sets for use as initial and boundary condition information. The wrf_prep script is the most complex of the run-time scripts as it must sort though a myriad of user options to determine which data to download, where to obtain the files, how to process the files, and then complete the horizontal and vertical interpolation to the user's computational domain. The final output files from wrf_prep are in netCDF format and serve as the input to the WRF REAL program, which is run by the wrf_run script.

All the necessary initialization files for this experiment already reside on your system, and thus, you will not have to access the files via ftp or http as you would when running in real-time.

Halt! - Before you Do:

```
% wrf_prep --dset gfsgrb2 --nfs --date 20070224 --cycle 12:00:24:03 --sfcdset ssthr --snfs
```

Answer the following questions:

Question #1: What is the meaning of each flag used in the wrf_prep command above? Hint: Look in the appropriate gribinfo.conf file for clues.

Option	Description
--dset gfsgrb2	
--nfs	
--date 20070224	
--cycle 12:00:24:03	
--sfcdset ssthr	
--snfs	

Question #2: How could the --cycle 12:00:24:03 flag be rewritten? Hint#1: you can include another flag. Hint#2: Look at the CYCLE description in the appropriate gribinfo.conf file.

Question #3: Where are the data files located on your system?

Now Do:

```
% wrf_prep --dset gfsgrb2 --nfs --date 20070224 --cycle 12:00:24:03 --sfcdset ssthr --snfs
```

Running wrf_prep should take approximately 8 to 12 minutes. Following successful completion, you will find the processed files located in the "siprd" directory. These files are in "netCDF" format and the contents may be scanned with the "read_wrf_nc" utility:

Do: % cd siprd

Do: % read_wrf_nc <filename>

Step III Configure the Simulation

You will not need to configure your run for this exercise as you will be using the default values defined in the configuration files; however, now is a good time for you to become familiar with the various subdirectories and files beneath the **conf** directory. To assist you in this task, please identify the following settings as specified in the configuration files.

Question #3: Please identify the following settings as specified in the configuration files.

Model Physics	Scheme
Cumulus scheme	
Microphysics scheme	
PBL Scheme	
Land Surface Scheme	
Short Wave Radiation	
Long Wave Radiation	
Model Dynamics	**Scheme**
Time integration Scheme	
Model Output Information	**Value**
Forecast Output Frequency	
Precip Accumulation Frequency	
Default Forecast File Format	

Step IV Run the simulation

The next step in making a simulation is to run the wrf_run routine. The purpose of the wrf_run script is to;

1) Read the files output from wrf_prep;
2) Run the wrf real.exe program to create the initial and boundary condition files for the primary and any nested domains; and
3) Execute either the NMM or ARW core of the model.

Before you begin the model run, take another look at your model run configuration and make sure everything is ok.

Do: % wrf_info

After reviewing the configuration information it is time to run the model:

Do: % wrf_run --SMDM

Question #4: What does the –SMDM flag mean?

The model will take some time to finish depending on the core (ARW or NMM) you chose to run. While the model is running, you may follow along with its progress with the command specified in the window.

You will not be post processing your forecast files for this exercise; however, you may still view previously created images for this case by pointing your browser to:

For the ARW core:

wrf/util/saws/lab2/web/arw/index.htm

Or for the NMM core:

wrf/util/saws/lab2/web/nmm/index.htm

End of Lab #2

Appendix A: NMM and ARW Experiment Model Configurations

Initialization Dataset:

Date:	24 February 2007
Cycle run:	1200 UTC GFS Model forecast
Data set	0.5 degree Global GFS Grib 2 format
BC frequency:	3 hourly

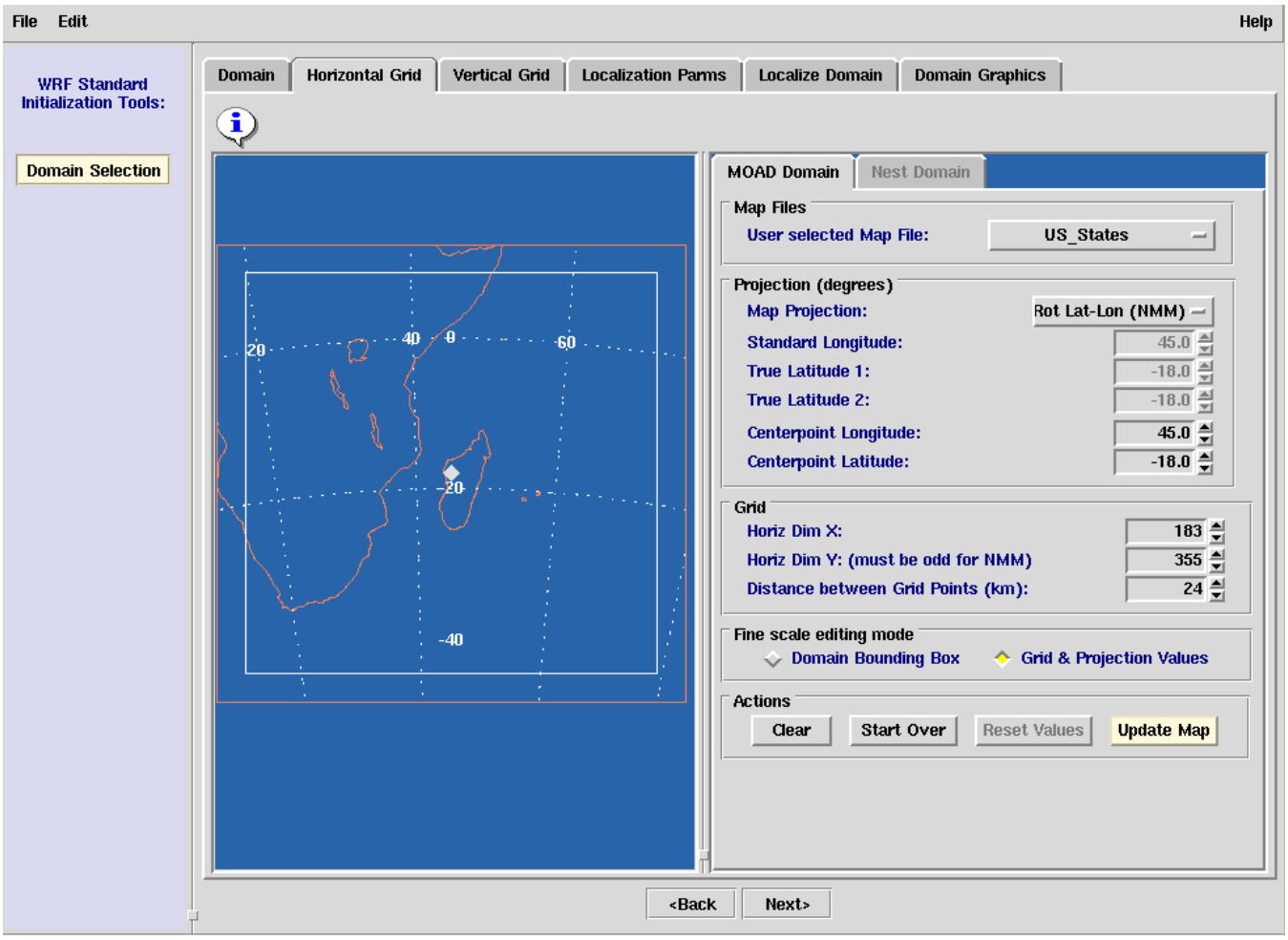
Model Domain:	**ARW**	**NMM**
Grid spacing:	24km	24km
Grid points(IM x JM):	261 x 251	183x355
Model levels:	31	31
Grid Center:	45E 18S	45E 18S
Map Projection	Lambert Conformal	Rotated Lat-Lon

Model Forecast Details:

Forecast length:	24 hours	24 hours
Dynamics	Non-Hydro	Non-Hydro

Appendix B: What your horizontal domain configuration window should look like

NMM Core Domain:



ARW Core Domain: